6.3 Manual Initialization of an SC2104 Radio Communicator ........................................................................... 27
7.0 Programming Worksheet – SC2104 Radio Communicator Account Setup ........................................ 29
8.0 Limited Warranty .............................................................................................................................................. 31

Figures

Figure 1: SAFECOM Communication System ........................................................................................................ 5
Figure 2: SC2104 Circuit Board ................................................................................................................................. 13
Figure 3: Non-expanded Mode Wiring ...................................................................................................................... 19
Figure 4: Expanded Mode Wiring ............................................................................................................................... 20
Figure 5: SC2104 Radio Communicator ........................................................................................................................ 21
Figure 6: SC2104 Antenna Connection ....................................................................................................................... 21
Figure 7: SC2104 ......................................................................................................................................................... 22
Figure 8: System Initialization Display ........................................................................................................................ 25
Figure 9: SC9000 Setup Menu ..................................................................................................................................... 26

Tables

Table 1: SC2104 Antenna Types ................................................................................................................................. 19
1.0 Introduction

1.1 SAFECOM Telemetry Communications System

SAFECOM is a long-range telemetry communications system for monitoring life safety security alarm panels which are remotely located at a customer site. The SAFECOM system utilizes specially designed telemetry transmitters and receivers to provide a secure and reliable radio communications link between remote alarm panels and a Central Monitoring Station. The information provided to the Central Monitoring Station allows security personnel or local authorities to respond immediately and appropriately to all alarm events detected at the customer site (see the following figure).

![SAFECOM Communication System Diagram](image)

Figure 1: SAFECOM Communication System

1.2 SAFECOM Communications Paths

The SC9000 Receiver acts as the nerve center of the SAFECOM Base Station. The SC9000 Receiver uses a personal computer to operate the ST1000 Receiver Software and provide radio communications with remote Radio Communicators via the RF2000 Radio Modem.

A remote Radio Communicator is a SAFECOM Communications Panel which is located at a customer site; commercial or residential. The SC9000 SAFECOM computer can supervise, monitor, and control up to 2,500 Radio Communicators through two-way telemetry radio communications.

The receipt of each message or poll that is transmitted is validated by the receiving site; SC9000 computer or Radio Communicator. The receiving site will then transmit an acknowledge message in response.

Supervisory polling is performed by the SC9000 computer for each Radio Communicator to verify two-way telemetry radio communications and the operational condition of the Radio Communicator. The supervisory polling interval is individually programmable for each Radio Communicator in the SC9000 computer account base.

The SAFECOM radios can be configured to transmit (TX) and receive (RX) on a single frequency pair directly to the Central Station. When the SAFECOM system is set up for Direct mode, the SC9000 computer communicates directly with the Radio Communicators in the field. No repeater is used for this type of SAFECOM system (usually found in smaller proprietary systems like those found on a Military Base, University, or Factory/Commercial Plant).
The SAFECOM radios can also be configured to transmit and receive on a frequency pair to a repeater located on a mountain, tower, or high building in the desired coverage area. When the SAFECOM system is set up for Repeater mode, the SC9000 computer communicates with the Radio Communicators through a UL Listed, SAFECOM SC801 or SC802 Data Repeater OR a commercial grade voice repeater that has been configured with a SAFECOM DP1000PWA controller board. The SC801/SC802 or equivalent repeater is normally installed at a Commercial Repeater Site.

The use of a SAFECOM type repeater or equivalent significantly increases the coverage area (range). Radio area coverage and reception ranges are also dependent on the extent of a number of environmental effects, e.g., propagation losses due to atmospheric conditions, the proximity of the radio transmission and reception paths to dense foliage and metal structures, etc.

The majority of SAFECOM Radio Communicators are ordered to TX and RX in the 450-470 MHz UHF frequency range. Other frequency bands currently supported by Radionics include, the 403-450 MHz, 470-512 MHz, 136-174 VHF range and the 900 MHz band. Additional frequency ranges are available upon request. The SC9000 computer can communicate with all Radio Communicators assigned to that specific SAFECOM network on a single RF "channel" through one SAFECOM RF2000 Radio Modem. A single RF "channel" is one radio frequency pair for either direct OR repeater communications.

With the installation of a SAFECOM 4 or 8 port Expander Board, the SC9000 computer can communicate on 1 to 8 independent and addressable RF "channels". Each RF "channel" communicates through a separate RF2000 Radio Modem. The addition of RF channels can be used to achieve backup redundancy in an area, or greater RF coverage range.

The SAFECOM IT1500 Installation Tester allows the installer to test for a standardized signal level from the remote radio site to the SC9000 computer and back, full two-way. Through this testing by a sales or service representative, a two-way communications link can be confirmed between a Radio Communicator and the Central Station Receiver PRIOR to the installation of a SAFECOM system.

1.3 Overview of SAFECOM Radio Communicators

Radionics manufactures the following SAFECOM Radio Communicators:

- **SC4000, Full Data Transfer, Eight Zones, Four Outputs, Radio Communicator**
  - UL Listed
  - Radio communications as primary path, phone-line backup
  - Full data transfer of all alarm panel signals
  - Eight Zones on board for Open/Closure/Voltage/Bell Out/Ground
  - Relay outputs for remote control, signaling, and/or automatic switching on-site

- **SC4000F, SSWF Fire Reporting Radio Communicator**
  - UL Listed for Supervisory, Sprinkler and Water Flow applications, reporting via radio only
  - Four on board SSWF inputs
  - Relay Outputs for remote control, signaling, and/or automatic switching on-site

- **SC3100, Full Data Transfer Radio Communicator**
  - Radio communications as primary path, phone-line backup
  - Full data transfer of all alarm panel signals

- **SC2104, Eight Zones, Phone-line Monitor, Radio Communicator**
  - Radio communications as primary or backup path
  - Phone line monitoring (line sniffing)
  - Eight zones on board for Open/Closure/Voltage/Bell Out/Ground

- **IT1500 SAFECOM Sales/Installation RF Tester**
  - Two-way radio communications tester for radio communicator site installations

- **SC801/SC802 SAFECOM Digital Data Repeater**
  - UL Listed for long range alarm reporting via radio
  - Fully addressable to allow up to eight independent repeaters in the same coverage area
  - Full battery backup and lockable cabinet, with tamper reporting via radio
1.4 SC2104, Eight Zones, Phone Line Monitor, Radio Communicator

The SC2104 Radio Communicator is a derivative of the capabilities and features found on the SAFECOM SC4000. The two-way radio communications characteristics and the ability to monitor contact open/closure status for up to eight zones, are identical to the SC4000. However, the SC2104 is a non-U.L. Listed device, it is NOT able to intercept and send alarm panel signals, and it is NOT configured with any relay outputs.

The SC2104 provides the ability to detect simultaneous loss of telephone line voltage and line current to the host alarm panel. This telephone line fault monitoring (sniffing) capability is performed by connecting the SC2104 in series between an alarm panel and the RJ31X phone jack. The telephone line fault monitoring ensures immediate and accurate line status reporting and enhances system integrity.

The SC2104 is also capable of monitoring contact open/closure status for four inputs. These input lines allow end-of-line (3.3kΩEOL) supervisory status monitoring for normal, open, and short conditions. Up to eight loops or devices, two per Input, may be monitored when the SC2104 is programmed for expanded loop monitoring. These inputs may be tripped from normally open or normally closed contacts, such as those found on a relay output/detector, or may be driven by a switching voltage source such as a programmable output provided by many alarm panels.

The SC2104 is normally installed as a independent backup device for interface with the customer’s existing alarm panel. It is located at the remote site; commercial or residential. The small physical dimensions of the SC2104 usually permits installation inside the can of the host alarm panel. With the SC2104 placed inside the alarm panel enclosure, interconnect wiring will not be exposed, and the SC2104 will be in a protected environment, thus providing greater system security and integrity. The antenna can be mounted directly on the alarm panel, by using the supplied bulkhead antenna connector and a “knock-out,” or it can be mounted remotely.

The telephone line monitor and input status messages are digitally encoded by the SC2104 and sent via a radio communications link to the Central Station’s SC9000 SAFECOM computer. The messages are processed and displayed by the SC9000 SAFECOM computer, then instantaneously passed to the central station’s automation software via an RS232 interface cable.

The SC2104 functions strictly in a supervisory capacity when interfaced with an existing alarm panel. The SC2104 is designed for easy installation and interface with most alarm panels, regardless of manufacturer.

Installation is performed by connecting (a) the alarm panel phone line output cable to the SC2104 modular “DIALER” jack, (b) the phone line cable from the RJ31X jack to the SC2104 modular “RJ31X” jack, and (c) the zone input devices.

No modifications to the existing alarm system are required. The normal operation of the alarm panel is NOT affected in any way. The existing detectors and initiating circuits still report the status of items directly to the alarm panel. The alarm panel then sends all signals to the central station via the installed phone line. The SC2104 monitors the phone line and has its own independent inputs.

The SC2104 requires a 11 -15 VDC (12 VDC), 350 mA, power source. This 12 VDC power source is normally provided by the auxiliary power supply of the host alarm panel. However, a 12 VDC separate power supply is an acceptable power source for the SC2104.

The SC2104 is supplied with an internal 12 VDC gel cell battery. The internal battery provides ALL of the necessary current for the radio when the SC2104 is transmitting (TX) and receiving (RX). This battery is mounted inside the SC2104 Radio Communicator and is accessible by removing the enclosure cover.

With the combination of four Inputs and the Telephone Line Fault Monitor, the SC2104 is usually installed in one of four possible configurations shown below:

1. The SC2104 will ONLY report changes in status for the telephone line. It will report any line failures or line restorals to the SAFECOM SC9000 computer after a programmable period of time has elapsed. No inputs are used in this application. This is a simple phone line monitoring system.

2. The SC2104 will ONLY report changes in status for it’s inputs. It will immediately report (within 0.7 seconds) any changes to the open, short, or restoral to normal status of it’s Inputs. No phone line at this site, hard input monitoring and reporting.

3. The SC2104 will report changes in status for both the telephone line and its inputs. The condition of reporting the changes in status of either is NOT dependent on the status of the other.

4. The SC2104 will ONLY report changes in status for it’s inputs, and these reports will ONLY be sent to the central station during a telephone line failure condition. This mode allows the SC2104 to operate as a back-up to an alarm panel by ONLY reporting alarm events to the SAFECOM SC9000 computer when the alarm panel dialer is unable to send the alarm event message due to Telephone line failure or intentional sabotage.
SC2104

Introduction
The SC2104 can NOT send its input status messages via a Telephone Line. SAFECOM radio communications is the ONLY reporting means of Telephone Line Fault and Input status reporting to the Central Station SC9000 computer from an SC2104.

1.5 Notices

1.5.1 Copyright Notice
Copyright ©2000 Radionics, a division of Detection Systems, Inc. All Rights Reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means without the written permission of Radionics.

1.5.2 Trademarks
SAFECOM™ is a trademark of Radionics, a division of Detection Systems, Inc. Other brand or product names are trademarks or registered trademarks of their respective holders.

1.5.3 Notice
The technical information in this manual has been carefully checked for accuracy and is presumed to be reliable and correct. However, Radionics assumes no responsibility for any inaccuracies and reserves the right to modify and revise this manual without notice. Changes are periodically made to the information herein; these changes will be incorporated in new editions of this publication.

Please contact our Technical Support Department to request copies of this publication, technical information, and product support for all of the SAFECOM product lines.

Radionics, a division of Detection Systems, Inc.
P.O. Box 80012, Salinas, California, USA, 93912-0012 - USA
Telephone: (831) 757-8877
(800) 538-5807

1.5.4 Federal Communications Commission (FCC) Statement
This equipment generates and uses radio frequency (RF) energy. If not installed and used properly, that is, in strict accordance with the manufacturer's instructions, it may cause interference to radio or television reception. This equipment has been tested and certified to comply with the specifications for a Class B digital device, pursuant to Subpart J of Part 15 of FCC rules. These specifications are designed to provide reasonable protection against such interference. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:
- Reorient the radio/television receiving antenna.
- Move the antenna leads away from any wire runs to the SAFECOM system.
- If using an indoor antenna, have a quality outdoor antenna installed.
- Relocate the SAFEOM system with respect to the radio/television receiver.

Connect the host alarm panel's AC transformer to a different outlet so the SAFEOM system and the radio/television are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user might find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington D.C. 20402. Stock No. 004-000-00345-4.

Properly shielded and grounded cables and connectors must be used for connection to peripherals in order to meet FCC emission limits. Radionics is not responsible for any radio or television interference caused by using other than recommended cables or by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

1.5.5 Federal Communications Commission (FCC) Notice To Users
1. Upon request only, the telephone company (TELCO) must be provided with a notice of intention to install or permanently remove the SC2104, along with the following information:
   a. Manufacturer: Radionics, a division of Detection Systems, Inc.
   b. Model Number: SC2104
   c. FCC Registration Number: 1 L3USA-73968-MO-N
   d. Ringer equivalence: O.OA
   e. Type of Jack: (USOC) RJ31X, RJ32X, or equivalent
Note: The SC2104 is intended to be used in conjunction with Alarm Dialing Systems, and makes use of the RJ31X, RJ32X, or equivalent jack required for such systems. An equivalent jack is one which, when the system is disconnected from the jack, will continue to allow proper operation of the customer’s telephone equipment.

2. The SC2104 may not be connected to a TELCO-operated coin telephone line. Connection to privately-operated coin telephones is subject to local or state regulation, but is not recommended by the manufacturer.

3. The TELCO may, under certain circumstances, temporarily discontinue service and/or make changes in its facilities or its service which may influence the operation of the SC2104. However, the telephone company is required to give adequate notice in writing of such changes or service interruptions.

4. In case of operational problems, disconnect the SC2104 (and Alarm Dialing System) from the TELCO line by removing the modular plug from the TELCO jack:
   If, after disconnecting the equipment from the TELCO jack, the customers regular phone operation has not been restored, notify the telephone company that they may have a problem, and request prompt service at no cost to the user. If a problem is found in premises wiring not installed by the TELCO, the customer will be subject to a service charge. If a fault is found in wiring installed by the TELCO, the customer may be subject to a service call charge.
   If, after disconnecting the equipment from the TELCO jack, the customers regular phone operation returns to normal, the equipment must remain disconnected until the SC2104, Alarm Dialing Equipment, or related wiring is serviced or replaced.

Unless otherwise noted in the Installation Guide (e.g. battery replacement, etc.), the SC2104 may not under any circumstances (in or out of warranty) be adjusted or repaired in the field. The location and phone number of the manufacturer, Radionics, is listed in this guide.
2.0 Specifications

2.1 SAFECOM SC2104 Radio Communicator Specifications

- Size: 4.5 in. W x 4.1 in. H x 2.5 in. D (11.4 cm W x 10.4 cm H x 6.4 cm D)
- Weight: About 1 lb. (0.5 kg) with internal 12 VDC battery
- Temperature: Operating: -20° to +50° C (-4° to +122°F)
- Temperature: Storage: -40° to +75° C (-40° to +167°F)
- Operating Voltage: 11 - 15 VDC, 350 mA, from an alarm panel auxiliary power, separate power supply, or external 12 VDC battery (11 - 15VDC, 850mA - peak if internal battery not used)
- Internal battery: 12 VDC, 0.8 Ahr, sealed gel cell
- Panel indicators: System Status LED & Radio Status LED
- Interface: TELCO line from RJ31X jack
  - Four inputs, flying leads
  - 12 VDC power, flying leads
  - RF cable, RG-58, for antenna
  - Alarm panel TELCO line - dialer

2.2 Standard Radio Specifications

Note: Specifications may vary in other frequency bands or with the use of various makes of radio transceiver modules.

Receiver
- Frequency range: 440 - 470 MHz
- Minimum Sensitivity: -113dBm (0.5 µV) for -12 dB SINAD
- Selectivity: 70 dB at 12.5 KHz Channel Spacing
- Frequency stability: ± 5 Part Per Million (PPM)

Transmitter
- Frequency range: 440 - 470 MHz
- Frequency stability: ± 5 PPM
- RF output power: 2 watts ± 0.2 W
- Deviation: ± 2 kHz ± 0.2 kHz
- Modulation: FM

Factory Supplied Antenna
- 14-16 inch (frequency band specific), rubber duck vertical ½ Wave
3.0 Circuit Board

3.1 SC2104 Circuit Board Components

The following information describes the function of the headers, LEDs, and some of the significant components located on the SC2104 Communications Panel circuit board:

![SC2104 Circuit Board Diagram]

3.1.1 System Status LED

The System Status LED is a bi-color (red and green) LED. It illuminates to indicate the status of radio communications between the SC2104 Radio Communicator and the central station. It also is used to indicate a “low internal battery” condition, and/or identify a hardware failure on the SC2104 during system initialization.

3.1.2 Radio Status LED

The Radio Status LED is a bi-color (red & green) LED. It illuminates to indicate transmit (red) and receive (green) status of the SC2104 internal radio module. This indication is helpful when sending and receiving signals.

3.1.3 “RJ31X” Modular Jack

This is a standard eight-pin RJ31X compatible female modular phone jack which is used for connecting the SC2104 to the premises RJ31X telephone jack (tip & ring on Pins 4 & 5 and house phone return from the alarm panel on Pins 1 & 8).

3.1.4 “Dialer” Modular Jack

This is a standard eight-pin RJ31X compatible female modular phone jack which is used for connecting the SC2104 to the alarm panel “phone line in & house phone out” (tip & ring to alarm panel on Pins 4 & 5 and house phone return from the alarm panel on Pins 1 & 8).

3.1.5 Main Interface Molex Connector

This is a specially keyed, female Molex connector. This connector is provided for interfacing the required 12 VDC power from the host alarm panel auxiliary power supply and interconnecting detectors/Aux. outputs to the SC2104 inputs. The SC2104 comes supplied with a mating male Molex connector with a flying lead wiring harness for wiring the 12 VDC power and SC2104 inputs. The 12 VDC power is provided by the red (+) and the black (-) wire leads on the Molex connector wiring harness. The INPUTS for the SC2104 are identified by silk-screen markings on the SC2104 enclosure. They are marked as “1,2,3,4”
3.1.6 JP-1 - CPU Reset (Reboot)

Allows system reset or initialization of the Central Processor Unit (CPU). Shorting the two pins on this header and cycling the system power will erase the program from the SC2104 making it operate as if it was a “new, out of the box” unit. See the section titled “Manual Initialization of an SC2104 Radio Communicator” for Manual Initialization (reboot) procedures.

3.1.7 Radio

This header is to connect the interface cable from the internal radio module to the RA500 Radio Adapter board inside the SC2104.

3.1.8 SP100 Charger Header

This four-pin header is used to interface the main SC2104 board to the SP100 Battery Charger board. The SP100 is mounted “piggy-back” on this header, and is secured in place with a single ¼” standoff.

**Note:** If it is desired to operate the SC2104 without the supplied internal battery, simply remove the SP100 Battery Charger board and battery, and place a jumper across the two pins closest to the CPU on header JP-4. This requires a stable, well regulated power source for operation without the internal battery.

3.1.9 Telephone Fault Relay

This relay monitors the telephone line current and voltage status to detect telephone line failures and restorals.

3.1.10 Battery Cutoff Relay

This relay disconnects the internal 12 VDC battery from the SC2104 circuitry when the external DC power source is removed.

**Note:** Once the SC2104 is programmed and brought on-line, this relay is disabled.

3.1.11 U1 - Microprocessor

Contains the system program the SC2104 needs to operate. This program is downloaded into the microprocessor from the SAFECOM computer via the SAFECOM radio network when the SC2104 is first powered up. The label on the microprocessor specifies the CPU S/N and PID # of this particular SC2104.

3.2 System Status LED Indications

The System Status LED illuminates to indicate the status of radio communications between the SC2104 and the Central Station SC9000 computer. It also can indicate a “Low Internal Battery” condition. The System Status LED also functions as a hardware fault indicator. See the section titled “Establishing Communications with the Central Station SAFECOM SC9000 Computer” for Hardware Fault LED indications.

There are 5 types of “System” LED indications for various conditions of a properly programmed SC2104 in the field.

1. Rapid blinking green: The “System” LED blinks green continuously at a rate of 5 times per second. After 90 seconds of power-up, this indicates that the SC2104 is in radio communications with the Central Station SC9000 computer and is “on-line”. This also indicates that the charge on the SC2104 internal battery is good (~ 11.5-14 VDC), Communications = Good, Battery = Good

2. Rapid blinking red: The “System” LED blinks red continuously at a rate of 5 times per second. After 90 seconds of power-up, this indicates that the SC2104 is NOT in radio communications with the central station SC9000 computer and is “off-line.” This also indicates that the charge on the SC2104 internal battery is good (~ 11.5-14 VDC). Communications = Bad, Battery = Good

3. Slow blinking red: The “System” LED blinks red slowly 5 times, then pauses for one second, then returns to the 5 slow red blinks. This indicates that the SC2104 system has shutdown because the charge on the SC2104 internal battery is so low that it can NOT activate the radio transmitter to send a message. Communications = Bad, Battery = Bad

The SC2104 will attempt to re-establish communications with the central station every 15 minutes after the low battery shutdown condition occurs. If the charge on the SC2104 Battery has NOT reached a minimum of 11.5 VDC, then the SC2104 will remain in the shutdown condition for another 15 minute period. It will continue this “attempt then shutdown” cycle until the battery charge has reached the minimum level.

The “battery restore” message will NOT be sent by the SC2104 until the charge on the SC2104 Battery has reached a minimum of 11.5 VDC during transmit TX ACTIVE.

**Note:** The SC2104 Battery voltage is ONLY tested when the radio transceiver is transmitting.
Note: The SC2104 internal battery is shipped from Radionics disconnected. The installer MUST open the SC2104 enclosure, and connect the internal battery connector. It is then recommended that the SC2104 be programmed into the SC9000 computer and brought “on-line” for a minimum of three hours prior to installation to charge the internal battery to a sufficient level. The SC2104 internal battery may NOT be charged to full capacity after an Idle, no charge period, such as during shipping from Radionics.

3.3 Radio Status LED Indications

The “Radio” Status LED illuminates to indicate the current transmit and receive status of the SC2104 Radio Communicator. This is a bi-color (red & green) LED. It illuminates to indicate the current transmit (red) and receive (green) status of the SC2104 internal Radio Communicator. This indication is helpful when sending and receiving signals.

This LED will illuminate red when the SC2104 is transmitting a signal to the central station.

This LED will illuminate green when the SC2104 is receiving any radio signals (carrier detect - CD) on the radio receiver frequency. This green indication can mean the SC2104 is receiving a signal from the central station, is “hearing” another SAFECOM Radio Communicator in the field, is being interfered with due to a high level of “RF noise” in the area, or is being intentionally jammed on the RX frequency.
Notes:
4.0 Pre-Installation Requirements

4.1 SC2104 Pre-Installation Requirements

Prior to the installation of the SC2104 Radio Communicator, several conditions must be satisfied and physical phenomena considered to ensure trouble free operation.

4.2 Wiring Requirements of the SC2104

All wiring utilized for the installation of the host alarm panel and the SC2104 Radio Communicator shall be in accordance with (IAW) local building codes. The following is recommended gauge and type wiring for installation of the host alarm panel and the SC2104:

- Alarm panel dialer phone lines: IAW industry installation standards.
- SAFECOM antenna RF cable: It is always preferred to utilize the RF cable provided by Radionics for installations of SC2104 Radio Communicators.
- SAFECOM antenna RF cable for remote antenna installation (antenna located remotely, away from the SC2104): For distances of 15 ft. (4.6 m) or less, use RG-58 or equivalent. For distances up to 30 ft. (9.1 m), use RG-8 or equivalent. For distances exceeding 30 ft. (9.1 m) or more, contact a Radionics SAFECOM Applications Engineer for recommendations.
- 12 VDC power from host alarm panel auxiliary power: Minimum 20 AWG (distance dependent).

4.3 DC Power Requirements of the SC2104 Radio Communicator

The SC2104 requires an 11-15 VDC (12 VDC), 350 mA, power source capable of providing 850 mA during transmission if the internal battery is not used. The 12 VDC power source supplies the operating voltage requirements for the SC2104 circuit board and charging the internal SC2104 battery. This 12 VDC power source is normally provided by the auxiliary power terminal of the host alarm panel. However, an 11-15 VDC stand alone DC power supply or external battery is an acceptable power source for the SC2104.

CAUTION

The SC2104 should NOT be connected to the battery terminal or smoke detector power of the host alarm panel.

4.4 SC2104 Internal Battery

The SC2104 is provided with a 12 VDC battery. This battery provides all of the necessary peak current (ampere) requirements for the SAFECOM Radio Transceiver. This battery is mounted inside of the SC2104 Radio Communicator and is accessible by removing the enclosure cover. Primary 12 VDC operating power for the SC2104 is normally supplied by the Host alarm panel.

Note: The SC2104 internal battery might NOT be at full capacity after an idle no-charge period during shipping from Radionics. The SC2104 battery must be connected internally and charged for a minimum of three hours prior to initialization for radio communications. This will ensure that the SC2104 internal battery charge is a minimum 11.5 VDC when the SC2104 is initially powered up for operation.

4.4.1 SC2104 Internal Battery Replacement

The SC2104 is provided with an internal 12 VDC, 0.8 Ahr, sealed gel cell battery. A suitable replacement battery may be purchased from Radionics (800) 538-5807.

4.4.2 Replacing The SC2104 Battery

1. Remove the external 12 VDC power source from the host alarm panel.
2. Loosen the four retaining screws on the SC2104 main enclosure cover.
3. Locate and remove the battery from the battery plate.
4. Disconnect the battery two pin Molex connector between the battery and the SP100 Charger Board.
5. Connect the two pin Molex connector to the new battery.
6. Reverse the above procedures to install the new battery and replace the SC2104 enclosure cover.
7. Re-connect the host alarm panel auxiliary 12 VDC power source.
SC2104

SC2104 Pre-Installation Requirements

4.5 SC2104 Radio Communicator Location

The SC2104 Radio Communicator is designed to be installed inside of the host alarm panel. If the size of the host alarm panel will not permit mounting the SC2104 inside or for special SC2104 configurations, then the SC2104 enclosure can be mounted directly to a vertical surface, like a wall, using the “keyhole” mounting holes provided on the rear of the SC2104 enclosure. This type of mounting will also require the use of an “L” bracket to mount the factory supplied antenna. This “L” bracket is provided with all SC2104 units sold by Radionics. The “L” antenna mount bracket is Radionics part number #80072-101.

The SC2104 is NOT environmentally sealed. Do NOT mount the SC2104 where it can be exposed to the elements.

If the antenna is mounted directly on the exterior of the host alarm panel enclosure, the alarm panel should be mounted on the inside of an exterior wall, for optimum radio transmission and reception. However, it should NOT be mounted in close proximity to:

- A cable bundle and/or wiring harness that is routed vertically and in close proximity to the SAFECOM antenna.
- A computer, PA, entertainment, or sound system.

The following should be considered when determining the location for mounting the SC2104:

- Space restrictions of the host Alarm Panel.
- Distance to the antenna from the SC2104 Radio Communicator.
- Antenna proximity to a cable bundle and/or wiring harness.
- Antenna proximity to computer, PA, entertainment, or sound systems.
- Easy access by a service technician.

4.6 Antenna Location

Improper antenna location is the single most common problem found in SAFECOM installations. The only way to properly determine the best location for the SAFECOM antenna installation is to use the SAFECOM IT1500 Installation Tester.

The SAFECOM IT1500 Tester must have a minimum of 9dB of attenuation installed between the Tester and the Tester’s antenna. If the Tester, along with the 9 dB attenuator does not produce a minimum of 10 “pass” indications following 10 tests, then the SAFECOM SC2104 Radio Communicator can not be installed in this location. Refer to the SC9000 Operations Manual section titled “Using the IT1500 Tester” for more information on finding another location within this building and testing possible antenna locations. For information on ordering an external attenuator for your SAFECOM IT1500 Tester, contact a SAFECOM Applications Engineer at (800) 538-5807.

If the SC2104 Radio Communicator is installed inside of a host alarm panel, then the antenna must be mounted external to the host alarm panel. Do NOT mount the antenna INSIDE of the host alarm panel enclosure.

A successful RF communications link between the SC2104 and the Central Station SC9000 computer may be subject to external interference. Several environmental effects must be considered when determining the proper location for mounting the SC2104 antenna.

Transmission and receipt of radio signals may be blocked by metal, mountains, hills, foliage and other natural and man made obstructions.

Some extent of radio signal degradation may be seasonal. Weather may significantly degrade reception ranges due to propagation from temperature layers and reflection from the moisture content in the atmosphere. Transmission and reception ranges may be reduced by dense foliage on trees and shrubs, or by snow. This degradation is normally experienced during the spring and summer months when the presence of leaves tends to block the signal path.

For optimum transmission and reception of radio signals, position the antenna as high as possible within the structure. Mounting the antenna on an elevated structure will enhance the line-of-sight TX/RX range and communications link effectiveness. The antenna should NOT normally be mounted inside metal buildings or enclosures. The proper antenna location is site specific for each installation.

All sales personnel should utilize the IT1500 Tester, with a minimum of 9dB of attenuation installed between the IT1500 Tester and the Tester antenna, to determine if two-way radio communications between the prospective customer site and the Central Station SC9000 computer is possible.
After the initial testing performed by the salesperson, the installer should utilize the IT1500 Tester, with a minimum of 9dB of attenuation installed between the IT1500 Tester and the Tester antenna, to determine the proper antenna location within the customer site for installation.

The IT1500 is a portable tester which transmits a radio signal from the remote customer site to the Central Station SC9000 computer and receives an acknowledge (ACK) message to verify a successful two-way communications link for that particular geographic location and antenna position.

**REMEMBER!** Moving the antenna location as little as four inches in either direction can mean the difference between a trouble free site or an angry customer that requires multiple service calls.

### 4.7 SC2104 Acceptable Antenna Types

The SC2104 is usually installed using the factory supplied omni-directional (OMNI) antenna. However, if testing using the IT1500 Tester, with a minimum of 9dB attenuation installed between the IT1500 Tester and the Tester antenna, shows that the factory supplied omni-directional antenna is not sufficient, then the installer may choose to use a direction, gain antenna. This type of antenna is usually referred to as a “beam” or Yagi type antenna. The following is a partial listing of acceptable types of antennas for installation on or external to the SC2104 Radio Communicator. Both the omnidirectional and Yagi type antennas are available to order directly from Radionics, call (800) 538-5807 for more information.

<table>
<thead>
<tr>
<th>Radionics Model Number</th>
<th>Description</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC921-xx</td>
<td>1/2 wave, 2.5 dB gain, RUBBER DUCK</td>
<td>400-512 MHz</td>
</tr>
<tr>
<td>C740A</td>
<td>3.0 dB gain, Omni whip</td>
<td>450-470 MHz</td>
</tr>
<tr>
<td>C742</td>
<td>10.0 dB gain, Directional (Yagi)</td>
<td>450-470 MHz</td>
</tr>
</tbody>
</table>

**Table 1: SC2104 Antenna Types**

#### 4.7.1 SC2104 Inputs

There are four Inputs on the SC2104. The status of each of the four inputs is monitored by an end-of-line (EOL) supervisory loop circuit. There are three possible states for each EOL supervised loop: Normal, Open, and Short. Each SC2104 input can be programmed at the Central Station SC9000 computer for non-expanded or expanded mode. By using the expanded mode, monitoring of up to eight auxiliary loops is possible. One or two auxiliary loops or devices can be monitored by each Auxiliary Input, depending on how the inputs are programmed.

#### 4.7.2 Non-Expanded

A non-expanded auxiliary input must be wired with a 3.3 kΩ EOL resistor. This external resistor is wired in series between the SAFECOM input wire (1,2,3, or 4) and the common ground on the SAFECOM SC2104 (black wire) (see the following figure).

![Wiring a SAFECOM Input for Non-Expanded Mode](image)

**Figure 3: Non-expanded Mode Wiring**
A SAFECOM SC2104 can be programmed for expanded mode. This mode allows the SAFECOM SC2104 to sense two different, independent contact closures per input. When using an expanded input type, you must wire the input with a 1.1KΩ and a 2.2KΩ 1% precision resistor (see the following figure).

![Figure 4: Expanded Mode Wiring](image-url)

For expanded SAFECOM inputs, the 1.1KΩ resistor forms the primary loop. Status conditions for the primary loops (across the 1.1KΩ) are reported to the Central Station SAFECOM SC9000 computer as “SHORT” or “NORMAL” on the corresponding input, “INPUT 1”, “INPUT 2”, “INPUT 3”, or “INPUT 4”.

For expanded SAFECOM inputs, the 2.2KΩ resistor forms the expanded or secondary loop. Status conditions for the secondary Loops (across the 2.2KΩ) are reported to the Central Station SAFECOM SC9000 computer as “SHORT” or “NORMAL” on the corresponding expanded input, “INPUT 1X”, “INPUT 2X”, “INPUT 3X”, or “INPUT 4X”.
5.0 Installation

This section describes the installation procedures for the SC2104 Radio Communicator.

5.1 SC2104 Radio Communicator

Mount the SC2104 at the location determined from the considerations discussed in the section titled “Pre-Installation Requirements.” The total weight of the SC2104 is about 1 pound with the internal 12 VDC battery installed.

The SC2104 is normally installed in an upright position in the bottom and inside of the host alarm panel enclosure (see the following figure).

5.2 Antenna

Each SC2104 Radio Communicator unit is shipped from Radionics with a 20-inch antenna coaxial cable assembly to mount the antenna directly on the host alarm panel enclosure (as shown above). The unit is also shipped with a 2 inch x 2 inch antenna mounting L-bracket for mounting the antenna directly on the side of the host alarm panel or for remote installation of the antenna.

If mounting the antenna directly on the host alarm panel, use the attached antenna coaxial cable assembly to connect the SC2104 Radio Communicator to the antenna (on the top of the host alarm panel enclosure). See the following figure.

The RF bulkhead connector on the end of the factory supplied coaxial cable, may be installed directly on the host alarm panel enclosure by using one of the following methods:
1. An existing knock-out port (on the top of the host alarm panel enclosure).
2. A ½ inch diameter hole, carefully drilled into the top of the host alarm panel enclosure.
3. The 2 inch x 2 inch factory supplied antenna mounting L-bracket (P/N 80072-101).

Use the 1.5 inch diameter antenna mounting washers (P/N 80074-101), with the antenna coaxial cable assembly to provide an adequate ground and physical support for the antenna when mounting the antenna on the top of the host alarm panel enclosure. The L-bracket installation does NOT require using the antenna mounting washers.

If a remote antenna location is required, mount the antenna in a suitable location as best determined by the results of IT1500 Tester. Use the 2-inch x 2-inch antenna mounting L-bracket to attach the antenna to a beam or supporting structure.

For remote antenna installations Radionics recommends using RG-58 for distances up to 15 feet. Use RG-8 for distances up to 30 feet.

5.3 Connecting Wires to the SC2104

Refer to the following illustration of the SAFECOM SC2104 Radio Communicator:

![Figure 7: SC2104](image)

5.3.1 Dialer

Connect the alarm panel Tip and Ring to this connector. The SC2104 “Dialer” connector is an eight-pin RJ31X compatible female modular jack.

5.3.2 RJ31X

Connect the premises RJ31X telephone jack to this connector. The SC2104 “RJ31X” connector is an eight-pin RJ31X compatible female modular phone jack.

5.3.3 Main Molex Connector

The SC2104 Main Molex connector is to be installed with the factory supplied six conductor wiring harness. This wiring harness contains the wires necessary for connecting the 12 VDC power source and the SAFECOM SC2104. The wires are identified as described in the following paragraph.

The following wires are supplied with the SAFECOM SC2104 wiring harness:

- Black (-) Ground: Connect the black wire to the negative (-) side of the host alarm panel Aux. Power 12 VDC supply.
- Red (+) 12 VDC: Connect the red wire to the positive (+) side of the 12 VDC power source.
- “1” - Input #1: - Connect the Input 1 wire to the factory supplied EOL resistor (3.3KΩ) with the other side of the resistor to the black wire on the SC2104. This will produce an “Input 1=Normal” condition. Then applying a contact closure across the EOL resistor will produce an “Input 1=Short” condition.
- “2” - Input #2: - Connect the Input 2 wire to the factory supplied EOL resistor (3.3KΩ) with the other side of the resistor to the black wire on the SC2104. This will produce an “Input 2=Normal” condition. Then applying a contact closure across the EOL resistor will produce an “Input 2=Short” condition.
• “3” - Input #3: - Connect the Input 3 wire to the factory supplied EOL resistor (3.3KΩ) with the other side of the resistor to the black wire on the SC2104. This will produce an “Input 3=Normal” condition. Then applying a contact closure across the EOL resistor will produce an “Input 3=Short” condition.

• “4” - Input #4: - Connect the Input 4 wire to the factory supplied EOL resistor (3.3KΩ) with the other side of the resistor to the BLACK wire on the SC2104. This will produce an “Input 4=Normal” condition. Then applying a contact closure across the EOL resistor will produce an “Input 4=Short” condition.

Note: The SC2104 is shipped from the factory with the internal 12 VDC battery installed, but not connected. Also, the battery might NOT be at full capacity after an idle, no-charge period during storage or shipping. The SC2104 battery should be charged for a minimum of three hours prior to installation. This will ensure that the SC2104 battery charge is sufficient when the SC2104 is initially powered up for operation.
Notes:
6.0 System Initialization

6.1 System Initialization Procedures

The following describes the system initialization procedures for the SC2104 Radio Communicator:

Contact the Central Station SAFECOM computer operator. Then verify that the following information is entered in the SAFECOM SC9000 computer account for the specific SC2104 you are working on!

You must build an account into the SAFECOM SC9000 computer before the computer will recognize and place “on-line” a unit in the field. Below is a summary of the parameters necessary to program an SC2104 account into the SAFECOM computer. This is the first setup menu. These parameters must be entered, then “Pg Down” to the second menu. The parameters that must be programmed by the Central Station are denoted in the following illustration and are summarized below:

![System Initialization Display](image)

**Figure 8: System Initialization Display**

- **S/N:** This number must match the CPU Serial Number listed on the label of the SAFECOM SC2104.
- **PID:** This number must match the PID number on the label of the SAFECOM SC2104.
- **Framer:** This should correspond to the framer that is to be assigned to this unit.
- **Poll Interval:** This is the time in hours, minutes, and seconds that the unit in the field is to be polled by the Central Station.
- **Vline:** The number placed here will report to the Automation System as coming in from “line XX.”
- **Vaccount:** The number placed here will report to the Automation System as signals coming from “account XXXX”.
- **Notes:** This area is used to note the account information such as: address, customer, account #, install date, etc.
System Initialization

The following illustrates the second setup menu in the SC9000 computer for programming an SC2104 account. Below is a summary of the parameters necessary to complete the programming of an SC2104 account into the SAFECON computer. This is the second setup menu. These parameters must be entered, then the operator will “escape” out and save the data to complete the building of the account.

**Figure 9: SC9000 Setup Menu**

- **Backpoll:** This parameter should be at least two minutes longer than the “Poll Interval” programmed in the first page of setup.

*Note:* Recent changes to the SAFECON System software rendered the Backpoll feature obsolete.

- **Report Battery?** This parameter enables the operator to allow the SC2104 to report a low battery condition.

- **Report TELCO:** This parameter enables the operator to command the SC2104 to monitor and report phone line failures.

- **TELCO Trouble Delay:** This sets the amount of time (in seconds) that the SC2104 will tolerate a phone line failure before reporting it. This is often helpful in areas where phone lines repeatedly “go down” without cause.

- **TELCO Restore Delay:** This sets the amount of time (in seconds) that the SC2104 will sense a phone line restore before reporting it. This is often helpful in areas where phone lines repeatedly “go down” without cause.

- **Enabled:** This parameter tells the SC2104 whether it must enable and monitor an input (if “N” then the input is disabled).

- **Delay Short:** This parameter makes the SC2104 wait for a period of time after the input is tripped before it will report the trip.

- **Fault Short:** This sets up the input to report an alarm condition upon sensing a short across the installed EOL (end-of-line) resistor.

- **Mask Short:** This parameter, if yes, allows the SC2104 to tolerate shorts on it’s inputs without reporting them. This is only when the phone line is good. In the event of a phone line failure, the SC2104 will report ALL “short” input status changes.

- **Delay Open:** This parameter makes the SC2104 wait for a period of time after the input is tripped before it will report the trip.

- **Fault Open:** This sets up the input to report an alarm condition upon sensing an N.C. contact opening the input loop. This requires the N.C. contact to be wired in series with the installed EOL (end-of-line) resistor.

- **Mask Open:** This parameter, if yes, allows the SC2104 to tolerate opens on it’s inputs without reporting them. This is only when the phone line is good. In the event of a phone line failure, the SC2104 will report all “open” status changes.
• **Input XLAT - 00 to 4F:** The Input Translation Table (XLAT) specifies the English plain text definition that you wish to assign to an Input. The text will be displayed in place of the default messages “Open,” “Short,” or “Normal.” The Input Translation Table has five pages, with 16 line numbers per page, for a total of 80 line numbers. Each line provides a maximum of eight characters for English text translation for Normal, Open, and Short Input conditions. The corresponding text assigned to the respective Input in the translation table is ONLY for display at the SC9000 computer. It is NOT part of the message sent to the Automation software. For example, input translation gives the operator the ability to allow an input on an SC2104 to report “TEMP HI” or “TEMP LO” instead of “INPUT SHORT” or “INPUT OPEN”. This ability can be very useful for processing alarm messages in the unlikely event of an automation system failure. Each translation table (XLAT) line contains three available conditions that the operator must define, “SHORT, OPEN, & NORMAL”. These are the only conditions the SC2104 can detect and report on its inputs.

**Note:** The SAFECOM ST1000 v2.41 and higher software default values for all new Radio Communicator input translation tables are “00” and the default values for line #00, in the Input Translation Table, are NORMAL, OPEN, and SHORT.

### 6.2 Establishing Communications with the Central Station SAFECOM SC9000 Computer

To establish radio communications between an SC2104 in the field and the central station:

1. Ensure the correct S/N, PID #, Framer #, and RF Channel are entered in the SC2104s account in the SAFECOM computer. **REMEMBER: The SC9000 computer is located at the Central Station.**
2. Connect the positive (+ red) and negative (- black) wires, from the SC2104’s Power Molex connector to the host alarm panel’s auxiliary power source. Power on.
3. The radio status LED on the SC2104 should illuminate red (TX) and green (RX) to indicate that the SC2104 Radio Communicator is transmitting and receiving. If the radio LED does NOT illuminate red to indicate that the system is transmitting after system power on, a hardware component failure is possible. When the SC2104 system detects a hardware failure, the system status LED on the SC2104 will illuminate red. The number of blinks indicates a specific type of hardware failure. The blinking cycle will continue until the auxiliary power source is removed from the SC2104.

The following describes the red blinking behavior of the system status LED during a hardware failure, and should NOT be confused with system status green LED illumination during normal SC2104 operations:
- 1 blink RED, PAUSE, then repeat: bad ROM checksum.
- 2 blinks RED, PAUSE, then repeat: failed RAM verify test.
- 3 blinks RED, PAUSE, then repeat: invalid CPU serial number.
- 5 blinks RED, PAUSE, then repeat: the SC2104 internal battery is low and must be charged.

### 6.3 Manual Initialization of an SC2104 Radio Communicator

The SC2104 Radio Communicator may be manually reset/initialized. The reset/initialize function is performed by a sequence involving momentarily shorting pins #1 and #2 on the JP-1 CPU RST Header. The JP-1 Header is located on the main SC2104 circuit board and requires disassembly of the SC2104 Radio Communicator.

**Note:** A manual initialization should ONLY be performed if all efforts to Initialize the SC2104 via a radio command from the SAFECOM SC9000 Computer have failed. Manual Initialization must be performed at the customer site and requires removing the SC2104 panel cover and battery plate.

**CAUTION**

The following procedure will erase all the programmed data in the CPU with the exception of the CPU serial number.

To manually initialize the SC2104 Radio Communicator:

1. Remove the auxiliary power source from the SC2104 (power off).
2. Loosen the four retaining screws on the SC2104 panel cover and remove the cover.
3. Loosen and remove the screws and battery mounting shelf, exposing the main SC2104 circuit board.
4. Short the two pins on the JP-1 Header together. Keep the short in place.
5. Apply the auxiliary DC power source to the SC2104 (power on). This step will initialize the CPU. The System Status LED will blink red three times, pause, then repeat. This indicates that all of the parameter EEPROM memory in the CPU has been erased.
6. Remove the short between the two pins on the JP-1 Header.
7. Remove the auxiliary power from the SC2104 (power off).
SC2104

System Initialization

8. Replace the SC2104 battery mounting shelf, panel cover and tighten the four retaining screws.

9. Apply auxiliary power to the SC2104 (power on). This step will initiate a system startup. The SC2104 will behave exactly like a brand new unit.
7.0 Programming Worksheet – SC2104 Radio Communicator Account Setup

Radio Communicator Number (3 digit number assigned by the Central Station Operator): ____________________

CPU Serial Number (9 digit S/N from SC2104 label): ____________________

Product ID (4 digit PID number from the SC2104 label): ____________________

Framer (assigned by the Central Station Operator): ____________________

Channel (assigned by the Central Station Operator): ____________________

Poll Interval (assigned by the Central Station Operator): ____________________

Vline (assigned by the Central Station Operator): ____________________

Vaccount (assigned by the Central Station Operator): ____________________

Notes (account information, Name, Address, Install date): ____________________

Backpoll (no longer used): 00:00:00

Report TELCO Trouble (assigned by the Central Station Operator): ____________________

TELCO Trouble Delay (assigned by the Central Station Operator): ____________________

TELCO Restore Delay (assigned by the Central Station Operator): ____________________

<table>
<thead>
<tr>
<th>Input Expanded?</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>1 X</th>
<th>2 X</th>
<th>3 X</th>
<th>4 X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay Short</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault Short</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mask Short</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault on Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mask on Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XLAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Notes:
8.0 Limited Warranty

Warranty Coverage and Duration
Radionics warrants to the original purchaser its Radionics manufactured “SAFECOM” products ("Product") against defects in material and workmanship under normal use and service for a period of one year from the date of purchase.

During the applicable warranty period, at no charge, Radionics will, at its option, either repair, replace or refund the purchase price of this Product, provided it is returned in accordance with the terms of this warranty to the place of purchase. Repair, at the option of Radionics, may include the replacement of parts, boards or other components with functionally equivalent reconditioned or new parts, boards or other components. Replaced parts, boards or other components are warranted for the balance of the original applicable warranty period. All replaced items shall become the property of Radionics.

RADIONICS MAKES NO GUARANTY OR WARRANTY THAT THE PRODUCT WILL PREVENT OCCURRENCES, OR THE CONSEQUENCES THEREOF, WHICH THE PRODUCT IS DESIGNED TO DETECT OR COMMUNICATE.

This express limited warranty is extended by Radionics to the original end-user purchaser only, and is not assignable or transferable to any other party. This is the complete warranty for SAFECOM products manufactured by Radionics, and Radionics assumes no obligation or liability for additions or modifications to this warranty. In no case does Radionics warrant the installation, maintenance or service of the Product.

Radionics is not responsible in any way for any ancillary equipment not furnished by Radionics which is attached to or used in connection with SAFECOM products, or for operation of the Product with any ancillary equipment, and all such equipment is expressly excluded from this warranty. Because of wide variations in topographical and atmospheric conditions, which may require availability of repeater stations or of particular radio frequencies, Radionics assumes no liability for range, coverage or suitability of the Product for any particular application.

Buyer acknowledges that Radionics does not know a particular purpose for which buyer wants the Product, and that buyer is not relying on Radionics' skill and judgment to select or furnish suitable goods.

This warranty applies only within the fifty (50) United States and the District of Columbia.

What this Warranty does NOT Cover
a) Defects or damage resulting from use of the Product in other than its normal and customary manner.
b) Defects or damage from misuse, accident or neglect.
c) Defects or damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment.
d) Disassembly or repair of the Product in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim.
e) Any Product which has had its serial number removed or made illegible.

How to Receive Warranty Service
To obtain warranty service, deliver or send the Product, transportation and insurance prepaid, to the place of purchase along with your proof of purchase and Product serial number. Alternatively, call (800) 538-5807 or (408) 757-8877.

General Provision
This warranty sets forth the full extent of Radionics' responsibilities regarding the Product. Repair, replacement or refund of the purchase price, at Radionics' option, is the exclusive remedy.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY APPLICABLE IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTY OF MERCHANTABILITY, ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. TO THE FULLEST EXTENT PERMITTED BY LAW, RADIONICS DISCLAIMS ANY LIABILITY FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVING OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE OR FAILURE OF SUCH PRODUCT.